

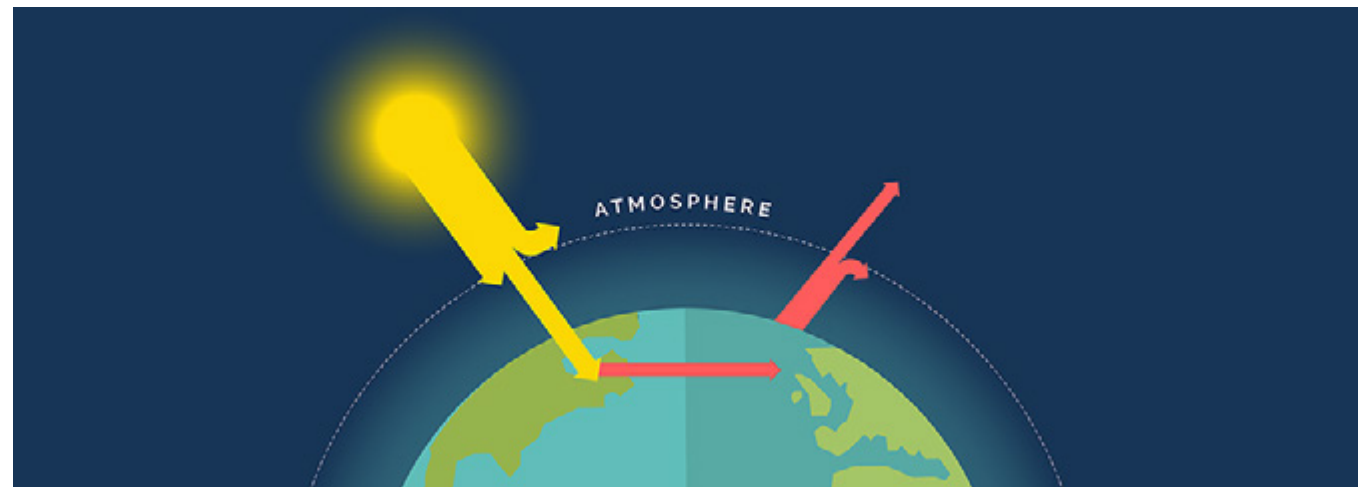
THE GREENHOUSE EFFECT

The greenhouse effect is a natural phenomenon through which heat from the sun is retained within the Earth's atmosphere. When the sun's rays reach the surface, the heat that radiates back gets trapped by the atmosphere. How does it work? In the same way a blanket retains the warmth of a body, the Earth's atmosphere is composed of different gases which trap the heat on the planet's surface while keeping out the cold from space.

How does it work ?

Radiation from the sun travels through the atmosphere (made up of gases) until it reaches the Earth's surface. The rays' energy is absorbed by the air, the oceans, and the different surfaces (soil, snow, etc.). The darker the surface, the more energy it retains from the sun's rays. Or conversely, the lighter the surface, the more it reflects the incoming radiation. This is called the albedo, or reflection factor. Accordingly, every surface absorbs more or less energy depending on its albedo. Some of that energy is then returned by the soil, the air, and the oceans in the form of heat, or infrared radiation. Atmospheric greenhouse gases trap those infrared rays and send them back towards the Earth. **This natural phenomenon keeps the planet warm.**

Did you know ?

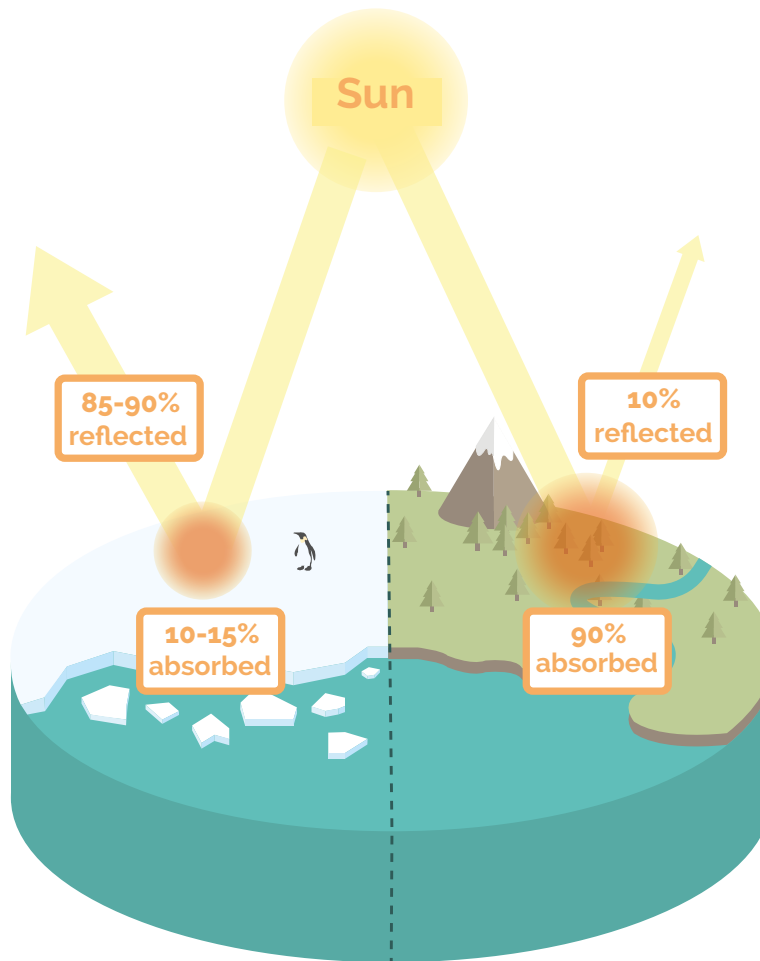


The term 'greenhouse effect' is an analogy to the warming mechanisms within greenhouses used in gardening. However, these two applications only have their name in common because they function in slightly different ways. While greenhouse gases in the atmosphere trap infrared (heat) while allowing air circulation, gardeners' greenhouses are transparent to infrared and the temperature rises because there is very little air movement inside.

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THE GREENHOUSE EFFECT



Albedo

Albedo is a measure of how much of the sun's radiation is reflected by the Earth's surface. For example, snow has a 'high albedo' as it reflects between 80 and 95% of all radiation back into space.

Fresh snow or ice: 80-95%
Melting snow: 40-70%
Clouds: 40-90%
Desert sand: 30-50%
Land masses/Soil: 5-30%
Tundra: 15-35%
Prairies: 25-30%
Forests: 10-20%
Water: 10-60%

THE GREENHOUSE EFFECT

Role of the Greenhouse Effect

Greenhouse gases in the atmosphere intercept infrared radiation (heat) given off by the Earth's surfaces. Thanks to the greenhouse effect, the average temperature on Earth is a comfortable 15°C. Without it, the average temperature would be -18°C, and our planet would most likely not be able to sustain life. Different greenhouse gases vary in their capacity to retain heat, and they have different lifespans. Luckily for us, those with the greatest heat retention capacity such as methane and nitrous oxide are present in smaller quantities, but they remain in the atmosphere for a very long time.

Carbon dioxide is perhaps the best known and most mediatised of all greenhouse gases. Although making up less than 1% of the atmosphere, its scarcity is misleading as **it is the second largest contributor to the greenhouse effect after water vapour.** Its weak presence is compensated by its efficiency in intercepting infrared, or its ability to trap the heat reflected by the Earth's surface.

Water vapour is the first contributor to the greenhouse effect.



THE GREENHOUSE EFFECT

Amplified Greenhouse Effect

Due to Human Activities

Although they are often criticised as being climate disruptors, greenhouse gases are indispensable for life on Earth. **However, the natural balance is being upset by human activities that amplify the greenhouse effect.**

The main amplification factor stems from **the burning of fossil fuels** such as oil, coal, peat, and natural gas. The industrial revolution was made possible thanks to the production of energy from oil and coal. Even today, oil is still the main energy source used to satisfy human needs. However, this type of energy creates all sorts of problems as it is finite, non-renewable, and it emits enormous amounts of CO₂ into the atmosphere. **Human-caused CO₂ emissions are large enough to amplify the greenhouse effect to such an extent as to disrupt the natural balance.** There are other factors apart from the burning of fossil fuels which contribute to enhancing the greenhouse effect even further.

The problem is exacerbated by other human activities: **Deforestation**, or intensive logging, also raises CO₂ concentrations in the atmosphere. Trees have the capacity to capture carbon. Due to deforestation, these carbon stores are released into the atmosphere when the wood is burned, or through the decomposition of dead trees.

H₂O

Proportion in the atmosphere : **55%**

CO₂

Proportion in the atmosphere : **39%**

CH₄

Proportion in the atmosphere : **2%**

N₂O

Proportion in the atmosphere : **2%**

O₃

Proportion in the atmosphere : **2%**



THE GREENHOUSE EFFECT

Intensive farming is another source of greenhouse gases, two of which are even more powerful than CO₂: The extensive use of fertilisers, rice crops, and cattle farming are all sources of **methane and nitrous oxide**. Adding to this are man-made greenhouse gases such as **fluorinated gases** (CFCs

or HCFCs), which are used in air conditioning. Despite their minimal atmospheric concentrations, HCFCs (Hydrochlorofluorocarbons) play an important role because their potential to enhance the greenhouse effect is two thousand times stronger than that of CO₂. There is no natural equivalent to these artificial gases, and their heat trapping capacity is extremely high. They represent additional greenhouse gases which nature cannot support.

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